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ABSTRACT

This digest describes proposed legislation for the implementation of the National Research and Education Network (NREN). Issues and implications for teachers, students, researchers, and librarians are suggested and the emergence of the electronic network as a general communication and research tool is described. Developments in electronic communications and computing since the late 1960s are reviewed, including the development of such networks as ARPANET, NSFNET, Internet, BITNET, CSNET, and CREN. Implementation of the National High Performance Computing Act of 1990 would provide for: (1) the involvement of science agencies and national libraries in the development of resources for the NREN; (2) the linking of federal and industrial laboratories, educational institutions, and libraries; (3) the development of electronic information resources and services; and (4) the development of supercomputers and advanced software to support scientific and engineering research. However, before such a network can be instituted, several issues need to be resolved, including how to determine costs and management policies, guarantee universal access, provide user support and training, overcome organizational resistance to networking, maintain quality control of information resources, and adapt network services to research and education norms. New initiatives for network research, services, and advocacy have emerged as a result of growing support for national networking; these include the Corporation for National Research Initiatives, Reference Point, the Coalition for Networked Information, and the Electronic Frontier Foundation. One common goal of these initiatives, one that educators and librarians share, is the desire to shape the future of national networking in such a way that its benefits are made available to a broad range of users. (10 references) (MAB)

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by

Ann P. Bishop

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The National Research and Education Network (NREN): Promise of a New Information Environment

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This digest describes proposed legislation for the implementation of the National Research and Education Network. Issues and implications for teachers, students, researchers, and librarians are suggested and the emergence of the electronic network as a general communication and research tool is described.

NREN Legislation

Senator Albert Gore introduced the National High Performance Computing Act of 1990 (S.1067) in order to create a national network of "information superhighways" designed to transmit billions of bits of data per second. The network would allow researchers, businesspeople, educators, and students around the country to communicate with each other and to access a broad range of research tools and information resources. Although Gore's bill did not pass by the time the 101st Congress adjourned in October 1990, it will most likely be reintroduced in January 1991. If the next version of the bill resembles its predecessors, we can expect that it will seek to accomplish some or all of the following objectives:

- Establish a Federal High Performance Computing Program in which science agencies and national libraries will fund and conduct research, and develop technologies and resources, appropriate for the NREN.
- Mandate the creation of the NREN--to link over 1,000 Federal and industrial laboratories, educational institutions, libraries, and other facilities--over the next five years.
- Promote the development of a number of electronic information resources and services on the NREN, such as directories of users and databases, electronic journals and books, access to computerized research facilities, tools, and databases, access to commercial information resources and services, and user support and training.
- Fund the development of supercomputers and advanced software to help resolve certain "grand challenges" in science and engineering.

The proposed legislation complements ongoing Executive branch activities. The main goals of these Federal initiatives are to help the U.S. to maintain its leading edge in high-performance computing and to improve national productivity. Continued research and development in high-performance computing and networking is seen as critical to the country's competitiveness, security, scientific and technological advancement, and, ultimately, to the welfare of its citizens. Although it is clear that the emphasis of the bill is on advanced computing and elite users, it nonetheless has the potential to create widespread changes in today's information environment.

A Changing Information Environment

Since the late 1960s, uses and audiences for electronic communication and computing have grown slowly but steadily in the research, education, and library communities. The Defense Advanced Research Projects Research Agency (DARPA) of the Department of Defense funded the development of the first successful prototype packet-switching network, known as ARPANET, in 1969. This network was used to connect organizations involved in government-sponsored research in computing and networking. ARPANET served both as an object of study and as a means to facilitate research communication and computing.

In 1984, NSF began establishing national supercomputer centers and designing a high-speed telecommunications backbone, known as NSFNET, to provide access to those centers for scientists and engineers in a variety of disciplines. Institutions can link their local networks to NSFNET through state or regional networks. These mid-level networks are independently operated and charge fees for connections and use. NSFNET is currently the nation's largest general purpose research network and serves as the backbone of the Internet, a collection of networks that use the communications protocol developed for ARPANET, called TCP/IP, for coding and transmitting electronic information. The Internet is currently comprised of over 400 interconnected national, regional, and institutional networks and is probably serving over a million users around the world. Further, gateways exist between the Internet and a variety of other networks.

Perhaps the most important of these is BITNET, a cooperative network founded in 1981 that is widely used in research and education today. BITNET differs from the Internet in several ways: it is not sponsored by the government, is not open to commercial enterprises, aims to serve scholars as well as scientists and engineers, and generally supports only electronic mail and file transfer. BITNET merged its organization with CSNET, a network used by computer science researchers, and became the Corporation for Research and Education Networking (CREN) in 1989. It currently connects over 1,300 sites around the world.

Network resources and services have expanded greatly in the 1980s, along with familiarity with the technology. Networking is gradually becoming a more familiar tool in the classroom, laboratory, office, and library. Current available services include:

- Electronic mail for exchanging messages
- File transfer for transmitting papers and data
- Online bulletin boards for posting queries and participating in discussions

- Online newsletters and journals for sharing news and research results.

These services make it easier to provide instruction to remote learners, collaborate with geographically-dispersed colleagues, and tap the expertise of a wide range of contacts.

Networks also currently provide online access to a variety of resources and tools, such as:

- Library catalogs and databases
- Commercial, governmental, and not-for-profit information services (e.g., Dialog, OCLC)
- Supercomputers
- Specialized software
- Specialized research instruments (e.g., telescopes), applications (e.g., medial imaging), and databases (e.g., satellite data).

These network services and resources facilitate both traditional and innovative education and research activities. They offer individuals at small or geographically remote institutions a "lifeline" to their colleagues and an opportunity to perform cutting-edge research. The NREN would, hopefully, encourage the further development of electronic services and resources. In addition, the NREN would make them available to an even broader audience, and its speed and capacity would exceed those of existing networks.

Issues in National Networking

Government and industry are working to solve technical problems such as increasing speed, capacity, connectivity, reliability, and interfaces of electronic networks. Political and economic problems are also receiving increased attention. But a number of other important issues will need to be resolved before national networking can reach its full potential. Problems include:

- Determining costs and establishing fees
- Guaranteeing universal access
- Providing adequate user support and training
- Determination of network use and management policies
- Overcoming organizational resistance to networking
- Providing directories and maintaining quality control of information resources
- Fitting network services to research and education norms for formal and informal communication.

These problems will be extremely difficult to resolve because a national network will connect a variety of institutions with differing goals, norms of behavior, and needs and because the network will still consist of a collection of smaller, independent networks. The library and education communities have expertise to lend in these areas, but they need to make both their expertise and their views better known to policy makers.

Emergence of New Initiatives

The gradual emergence of national networking has spawned a number of new initiatives for network research, services, and advocacy. The Corporation for National Research Initiatives, with a $15.8 million grant from NSF, is overseeing hardware and software experimentation that will be carried out by a number of corporate, academic, and government institutions. NSF is also sponsoring research on the development of a national "Collaboratory," a collection of electronic research resources that would promote and facilitate collaboration on a national scale. Reference Point, primarily a service organization, hopes to assist the volunteer sector in the development and use of new technologies for accessing, exchanging, and disseminating information. An important new advocacy group is the Coalition for Networked Information (CNI), whose members are academic and corporate information and computing professionals. CNI aims to promote the provision of electronic information services, and is particularly concerned with linking libraries to the network. The Electronic Frontier Foundation has been established to address the impact of electronic communication on society. It will foster public education on social and legal issues and support litigation to protect First Amendment rights in an electronic environment.

What these initiatives share is the desire to shape the future of national networking in such a way that its benefits are made available to a broad spectrum of users. Librarians and educators, in particular, can get involved in such initiatives to assure that the needs and perspectives of their constituencies receive adequate attention from national policy makers and network developers.

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